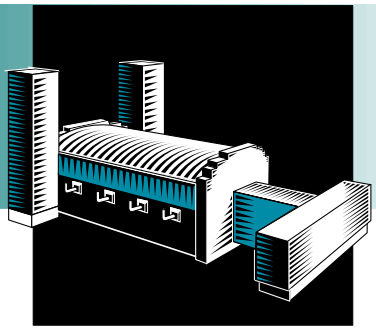
GLASS
Project Fact Sheet



Measurement and Control of Glass Feedstocks

Benefits

- Enhanced product quality
- Increased productivity
- Decreased energy consumption
- Reduced emissions

Applications

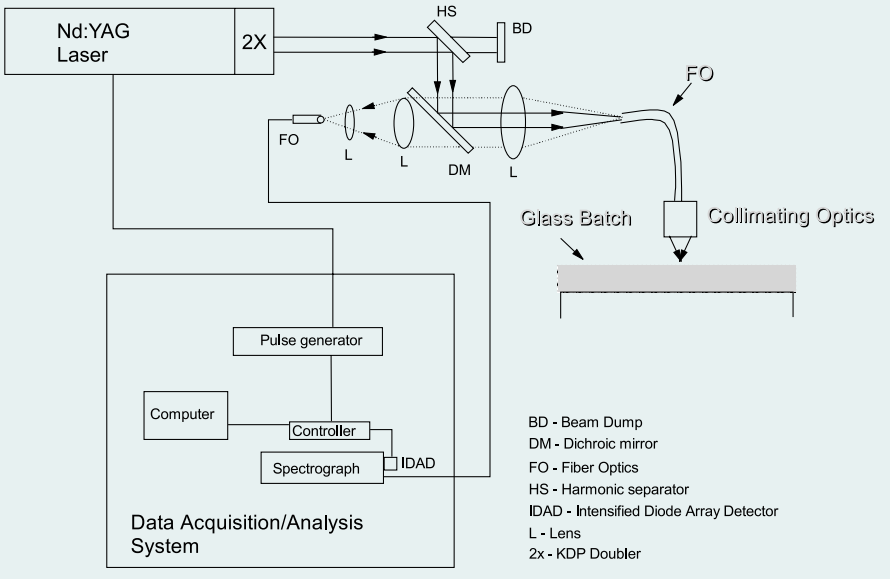
The LIBS device can be used to determine the chemical makeup of glass feedstock before it enters the melting furnace. The technology can improve product quality by determining batch integrity, sorting cullet by color, and detecting contaminants. The technology is expected to dramatically improve competitiveness in all sectors of the U.S. glass industry.

Technology to Measure Chemical Makeup of Glass Feedstocks Can Enhance Product Quality and Increase Productivity

Laser-induced breakdown spectroscopy (LIBS) promises a new way for glass manufacturers to significantly increase productivity. By measuring the chemical makeup in raw materials and recycled glass cullet, LIBS can quickly detect contaminants and batch nonuniformity. By preventing the production of defective products, glass manufacturers can reduce production costs and improve glass quality.

LIBS provides high measurement speeds for the high throughput of small particles. The technology is capable of measuring both granular materials in the batch as well as larger materials, such as ceramic contaminants, that are often found in the cullet. These capabilities ensure that poor quality or non-uniform raw materials, contaminants, and batch mixtures do not enter the furnace. As a result of repeatable batch formulations entering the furnace, the technology will also allow for more optimal furnace parameters for particular mixtures.

Schematic of LIBS System



By using the LIBS system and analyzing the data obtained, chemical makeup can be quickly determined.

Project Description

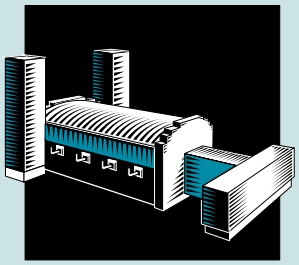
Goal: Develop a laser-induced breakdown spectroscopy (LIBS) probe to measure in real time and in-situ the chemical makeup of industrial glass processes and feedstocks.

The LIBS device can immediately determine if a process or feedstock is off-spec and can be used in a feedback control loop to correct problems. Project partners have already experimentally verified LIBS probe feasibility and are now beginning experimental work on glass batch grains, recycled glass, and related contaminants.

During the project, partners will focus on resolving problems associated with signal variability. In order to analyze many pieces of cullet per second, researchers must develop faster techniques. Artificial Neural Network (ANN) software will be tested to provide high-speed analysis of LIBS data. Other novel mathematical techniques will be employed to mitigate the effects of noise on LIBS signals.

Progress and Milestones

- The project was awarded in late 2000.
- During the first year of the project, researchers will develop the following capabilities:
  - Measure elemental composition of glass batch
  - Distinguish among different cullet colors at high speeds
  - Identify contaminants at high speeds
- During the second and third year of the project, researchers will
  - Incorporate the ANN and remote sensing software into the LIBS Probe
  - Determine optimal settings of the LIBS instrument using flowing glass batch, cullet, and contaminants at the Fenton Glass facility.
- The application of laser induced breakdown spectroscopy to inspect glass processes and feedstocks is expected to yield the following benefits:
  - 20 percent reduction in product defects, saving the glass industry $220 to $440 million
  - Energy savings of 260 to 520 billion Btu per year



Project Partners

Energy Research Company
Staten Island, NY

Fenton Art Glass Company
Williamstown, WV

Mississippi State University
Mississippi State, MS

Oak Ridge National Laboratory
Oak Ridge, TN

For additional information, please contact:

Elliott Levine
Office of Industrial Technologies
Phone: (202) 586-1476
Fax: (202) 586-3180
E-mail: elliott.levine@ee.doe.gov

Please send any comments, questions, or suggestions to webmaster.oit@ee.doe.gov

Visit our home page at www.oit.doe.gov

Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585

OIT

January 2001